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Notes:

1. Untranslatable words are replaced with asterisks (***).
2. Texts in the figures are not translated and shown as it is.

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Dictionary: Last updated 10/08/2008 / Priority: 1. Chemistry / 2. Natural sciences / 3. Technical term

CLAIM + DETAILED DESCRIPTION

[Claim(s)]

[Claim 1] It is the polymer which has an amino group and an alkoxy silyl machine and which consists of 40 to 100 weight % of conjugated diene monomeric units, and 60 to 0 weight % of aromatic vinyl monomer units. Diene rubber whose weight average molecular weights the amount of vinyl bindings of a conjugated diene joint unit is 100,000-2,000,000 at 60% or more.

[Claim 2] Organic alkali metal amide is used as an initiator for conjugated diene or conjugated diene, and aromatic vinyl in a hydrocarbon system solvent. The manufacture method of the diene rubber according to claim 1 characterized by making an alkoxysilane compound or an epoxy group content alkoxysilane compound react after making it polymerize under existence of a polar compound (**).

[Claim 3] The rubber constituent containing the rubber component containing diene rubber according to claim 1 and a reinforcer.

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] It relates to the diene rubber excellent also in tensile strength, abrasion resistance, and workability, and its manufacture method while showing the outstanding febrility, when this invention is blended [silica] as a reinforcer. Moreover, this invention relates to the rubber constituent containing the rubber component containing this diene rubber and a reinforcer.

[0002]

[Description of the Prior Art] Contributing to low-fuel-consumption-ization is called for by the demand to low-fuel-consumption-izing of a car becoming still severer, and making rolling resistance small also with an automobile tire as saving resources, an environmental measure,

etc. are thought as important in recent years. In order to make rolling resistance of a tire small, generally the rubber material which can give febrile low vulcanized rubber is used as a rubber material for tires.

[0003] Lowering febrility is proposed by using the rubber constituent which changed to diene rubber as a rubber material for tires, changed to carbon black as a reinforcer, and blended silica conventionally. However, the silica compounded rubber composition had the problem that sufficient abrasion resistance and tensile strength were not obtained, compared with the carbon black compound constituent. Since one of the cause of this has the compatibility of silica to diene rubber smaller than carbon black, it is thought that it is in the ability not to discover sufficient reinforcing effect.

[0004] In order to raise the compatibility of silica and diene rubber conventionally, using the diene rubber which introduced silica and an affinitive substituent is examined. For example, an alkyl silyl machine (JP,H1-188501,A), a halogenation silyl machine (JP,H5-230286,A), The diene rubber which introduced a substituted amino group (JP,S64-22940,A), an alkoxy silyl machine, a substituted amino group (JP,H7-233216,A) or an alkoxy silyl machine, a substituted amino group, hydroxyl (JP,H7-233217,A), etc. is proposed.

[0005] However, many of diene rubbers which introduced these substituents are inferior to the workability at the time of mixing with silica, and it has the fault that characteristics, such as febrility, tensile strength, and abrasion resistance, are not fully improved, either.

[0006]

[Problem(s) to be Solved by the Invention] When silica is blended as a reinforcer, the purpose of this invention is excellent in the febrility used as the index of rolling resistance, and moreover shows tensile strength and abrasion resistance equivalent to a carbon black compound, and there is workability in offering good diene rubber and its manufacture method. Other purposes of this invention are to offer the rubber constituent which contained diene rubber and a reinforcer and was excellent in febrility, tensile strength, abrasion resistance, workability, etc.

[0007]

[Means for Solving the Problem] In order that this invention persons may conquer the problem of said conventional technology, as a result of repeating research wholeheartedly, as a rubber component By blending with silica the diene rubber which has an amino group and an alkoxy silyl machine, and fully raised the amount of vinyl bindings for a conjugated diene bond part The rubber constituent excellent in febrility, tensile strength, abrasion resistance, and workability is obtained, And this diene rubber uses organic alkali metal amide, such as organic lithium amide, as an initiator. It finds out being obtained by making conjugated diene or conjugated diene, and aromatic vinyl react with an alkoxysilane compound or the EPO KISHIKI machine content alkoxysilane compound, after polymerizing under existence of a polar

[0008] According to this invention, have an amino group and an alkoxy silyl machine in this way. It is the polymer which consists of 40 to 100 weight % of conjugated diene monomeric units, and 60 to 0 weight % of aromatic vinyl monomer units, and the diene rubber whose weight average molecular weights the amount of vinyl bindings of a conjugated diene joint unit is 100,000-2,000,000 at 60% or more is offered. According to this invention, further Organic alkali metal amide is used as an initiator for conjugated diene or conjugated diene, and aromatic vinyl in a hydrocarbon system solvent. After making it polymerize under existence of a polar compound (**), the manufacture method of the diene rubber according to claim 1 characterized by making an alkoxysilane compound or an epoxy group content alkoxysilane compound react is offered. According to this invention, the rubber constituent which contains further the rubber component containing the above-mentioned diene rubber and a reinforcer is offered.

[Embodiment of the Invention]

[0010] As conjugated diene, 1,3-butadiene, 2-methyl 1,3-butadiene, 2, 3-dimethyl 1,3-butadiene, 2-chloro-1,3-butadiene, 1,3-pentadiene, etc. are mentioned, for example. Also in these, 1,3-butadiene, 2-methyl 1,3-butadiene, etc. are desirable, and 1,3-butadiene is more desirable. Such conjugated dienes are independent, respectively, or can be used combining two or more sorts.

[0011] As aromatic vinyl, for example Styrene, alpha-methyl styrene, 2-methyl styrene, 3-methyl styrene, 4-methyl styrene, 2, 4-diisopropyl styrene, 2, 4-dimethyl styrene, 4-t-butyl styrene, 5-t-butyl 2-methyl styrene, monochlorostyrene, dichloro styrene, mono-fluoro styrene, etc. can be mentioned. Also in these, styrene is desirable.

[0012] The existence of the aromatic vinyl monomer unit in diene rubber can be suitably chosen according to the purpose of use. When thinking especially febrility as important, the homopolymer of conjugated diene is chosen. On the other hand in making febrility and wet skid resistance balance highly The copolymer of conjugated diene and aromatic vinyl has it, and [desirable / the content of each monomer in the copolymer in that case] a conjugated diene monomeric unit -- usually -- 40 to 95 weight % -- desirable -- 50 to 90 weight % -- more -- desirable -- 55 to 85 weight %, and an aromatic vinyl monomer unit -- respectively -- usually -- it is 45 to 15weight % of a range more preferably 50 to 10weight % 60 to 5weight %.

[0013] Although you may combine with which place of a polymer chain, an amino group and an alkoxy silyl machine are polymer chain ends preferably, and are especially combined with the

desirable separate end of a polymer chain. When an amino group and an alkoxy silyl machine combine with a polymer chain end, especially the separate end of a polymer chain, since the still higher modification effect can be shown, it is suitable.

[0014] Although you may be any of the 1st class, the 2nd class, and the 3rd class as an amino group, it is the 3rd class amino group suitably. As the 3rd class amino group, even if two substituents have been independent, respectively, two substituents may join together and a ring system may be formed, for example, it is a general formula (1).

[Formula 1]



(-- among a formula, an alkyl group, a cycloalkyl machine, an aryl group, an aralkyl machine, an alkoxyalkyl group or R¹, and R² may combine with each other, and R¹ and R² may form a ring system independently, respectively.) -- it is expressed.

[0015] R¹ in a general formula (1), and the carbon number of R² -- usually -- 1-20 -- desirable - - 1-15 -- it is the range of 1-10 more preferably. Respectively R¹ and R² show an alkyl group, a cycloalkyl machine, an aryl group, an aralkyl machine, and an alkoxyalkyl group, they are an alkyl group, an aryl group, and an aralkyl machine independently preferably, and are an alkyl group especially preferably. As an alkyl group, for example A methyl group, an ethyl group, a propyl group, an isopropyl group, A n-butyl machine, sec-butyl, tert-butyl, a n-amyl machine, An isoamyl machine, a n-hexyl machine, a n-octyl machine, n-dodecyl, n-octadecyl machine etc. is mentioned and also in these A methyl group, an ethyl group, Low-grade alkyl groups, such as a propyl group, an isopropyl group, a n-butyl machine, sec-butyl, tert-butyl, a n-amyl machine, an isoamyl machine, and a n-hexyl machine, etc. are desirable, and a methyl group, an ethyl group, n-propyl group, especially a n-butyl machine, etc. are desirable. As a cycloalkyl machine, a cyclopentyl group, 2-methyl cyclopentyl group, a cyclohexyl machine, etc. are mentioned, for example. As an aryl group, a phenyl group, the phenyl group of low-grade alkyl-group displacement, a naphthyl group, a biphenyl machine, etc. are mentioned, and they are a phenyl group and the phenyl group of low-grade alkylation preferably, for example. As an aralkyl machine, benzyl, a phenethyl machine, the benzyl of low-grade alkyl-group displacement, etc. are mentioned, for example. As an alkoxyalkyl group, for example A methoxymethyl machine, an ethoxymethyl machine, Low-grade alkoxyalkyl groups, such as a propoxy methyl group, a butoxy methyl group, beta-methoxy ethyl group, beta-ethoxyethyl machine, a beta-propoxy ethyl group, and gamma-methoxy propyl group, etc. are mentioned.

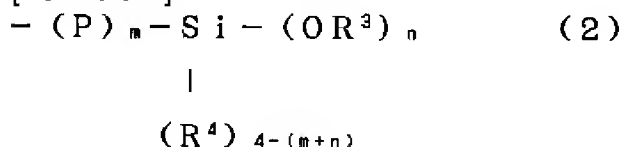
[0016] [two substituents] as an example of the 3rd class amino group in which it became independent, respectively For example, a dimethylamino machine, a methylethylamino machine, a methylpropyl amino group, A methylbutylamino machine, a methyl amyl amino group, an amyl hexylamino machine, A diethylamino machine, an ethyl propylamino machine, an ethyl butylamino machine, An ethylhexyl amino group, a dipropylamino machine, a

diisopropylamino machine, A propyl butylamino machine, a dibutylamino machine, the Gia Mill amino group, a dihexyl amino group, A diheptyl amino group, a dioctylamino machine, a methyl cyclopentylamino machine, An ethyl cyclopentylamino machine, a methylcyclohexyl amino group, a JISHIKURO pentylamino machine, A dicyclohexylamino machine, a diphenylamino machine, an N-methyl N-phenylamino machine, an N-ethyl N-phenylamino machine, a dibenzylamino machine, an N-methyl N-benzylamino machine, an N-ethyl N-phenethyl amino group, etc. are mentioned. Also in these, a dimethylamino machine, a methylethylamino machine, a diethylamino machine, a dipropylamino machine, a diisopropylamino machine, a dibutylamino machine, the Gia Mill amino group, a dihexyl amino group, a diheptyl amino group, a dioctylamino machine, etc. are desirable.

[0017] the ring system which R1 in a general formula (1) and R2 combined mutually -- usually - 4 - 12 membered-ring structure -- desirable -- 5 - 10 membered-ring structure -- it is 5 - 8 membered-ring structure more preferably. Specifically, for example An aziridine ring, an acetidin ring, a pyrrolidine ring, A piperidine ring, 2-methyl piperidine ring, 3-methyl piperidine ring, 4-methyl piperidine ring, 3, 5-dimethyl piperidine ring, 2-ethyl piperidine ring, A hexamethyleneimine ring, a heptamethyleneimine ring, a dodeca methyleneimine ring, A coniine ring, a morpholine ring, an N-ethyl piperazine ring, N-methylimidazo lysine ring, an oxazin ring, a pyrroline ring, a pyrrole ring, An azepine ring etc. is mentioned and a pyrrolidine ring, a piperidine ring, 3-methyl piperidine ring, 4-methyl piperidine ring, 3, 5-dimethyl piperidine ring, 2-ethyl piperidine ring, a hexamethyleneimine ring, a heptamethyleneimine ring, etc. are desirable also in these.

[0018] The alkoxyl silyl machine combined with a polymer chain is a silicon atom content machine which at least one alkoxy group combined with the silicon atom, and is a general formula (2), for example.

[Formula 2]



the alkyl group in which R3 and R4 may have a substituent among a formula, and the cycloalkyl machine which may have a substituent -- As for the aralkyl machine and P which may have the aryl group which may have a substituent, or a substituent, a polymer chain and m show the integer of 1-3, n shows the integer of 1-3, and m+n shows the integer of 2-4. It is expressed.

[0019] R3 in a general formula (2), and the carbon number of R4 -- usually -- 1-20 -- desirable - 1-15 -- it is the range of 1-10 more preferably. R3 and R4 are the alkyl groups which may show the alkyl group which may have a substituent, the cycloalkyl machine which may have a

substituent, the aryl group which may have a substituent, and the aralkyl machine which may have a substituent, and may have a substituent independently preferably, respectively. As a substituent of an alkyl group, a cycloalkyl machine, an aryl group, and an aralkyl machine There is no exceptional restriction and For example, a halogen atom, a nitro group, hydroxyl, An alkoxy group (and an alkyl group; in the case of a cycloalkyl machine, an aryl group, and an aralkyl machine) etc. is mentioned, it is a halogen atom, a nitro group, an alkoxy group, etc. preferably, and they are a halogen atom and a nitro group more preferably. As an alkyl group, for example A methyl group, an ethyl group, a propyl group, an isopropyl group, A n-butyl machine, sec-butyl, tert-butyl, a n-amyl machine, An isoamyl machine, a n-hexyl machine, a n-octyl machine, n-dodecyl, n-octadecyl machine etc. is mentioned and also in these A methyl group, an ethyl group, Low-grade alkyl groups, such as a propyl group, an isopropyl group, a n-butyl machine, sec-butyl, tert-butyl, a n-amyl machine, an isoamyl machine, and a n-hexyl machine, etc. are desirable, and a methyl group, an ethyl group, n-propyl group, especially a n-butyl machine, etc. are desirable. As a cycloalkyl machine, a cyclopentyl group, 2-methyl cyclopentyl group, a cyclohexyl machine, etc. are mentioned, for example. As an aryl group, a phenyl group, the phenyl group of low-grade alkyl-group displacement, a naphthyl group, a biphenyl machine, etc. are mentioned, and they are a phenyl group and the phenyl group of low-grade alkylation preferably, for example. As an aralkyl machine, benzyl, a phenethyl machine, the benzyl of low-grade alkyl-group displacement, etc. are mentioned, for example.

[0020] The rate of vinyl binding (1 and 2-vinyl binding and 3, 4-vinyl binding) in the conjugated diene joint unit of the diene rubber of this invention is 65 to 85% of range more preferably 60 to 90% 60% or more. If the vinyl joint rate of a conjugated diene joint unit is too small, febrility, tensile strength, abrasion resistance, and workability are not enough, and desirable. What has a too high vinyl joint rate has manufacturing restrictions. The conjugated diene joint unit of the remainders other than vinyl binding may be 1 and 4-binding, and may be any of 1, 4-cis-binding, 1, and 4-transformer binding.

[0021] [distribution / in case the diene rubber of this invention contains aromatic vinyl / aromatic vinyl chain] Although restriction in particular is not carried out, the amount of independent chains of one aromatic vinyl unit 40weight % or more of the amount of joint aromatic vinyl It is 70 weight % or more still more preferably 60weight % or more preferably. And since the thing of the amount of joint aromatic vinyl whose amount of aromatic vinyl long chains with which eight or more aromatic vinyl was connected is 1.5 or less weight % still more preferably 2.5 or less weight % preferably 5 or less weight % makes febrility, abrasion resistance, and wet skid resistance balance for a high price, it is suitable.

[0022] The molecular weight of diene rubber is the polystyrene equivalent weight average molecular weight (Mw) of gel permeation chromatography at this invention. 100,000-2,000,000 -- desirable -- 150,000-1,500,000 -- it is the range of 200,000-1,200,000 more preferably. If it is

inferior to febrility or abrasion resistance when the weight average molecular weight (Mw) of diene rubber is too small, and it is too large conversely, it is inferior to workability and neither is desirable.

[0023] [the method] although the manufacture method in particular of the diene rubber of this invention is not restricted For example, after using an organic alkali metal as an initiator for conjugated diene or conjugated diene, and aromatic vinyl in a hydrocarbon system solvent and making it polymerize under existence of a polar compound (**), it can carry out by making an alkoxysilane compound or an epoxy group content alkoxysilane compound react.

[0024] [the organic alkali metal amide used for this invention] like the method which may use the thing to which an alkali metal and secondary amine were made to react beforehand, and is indicated by JP,H6-199921,A An organic alkali metal is added under the monomer and secondary amine existence of at least one copy, and you can generate in a polymerization reaction system.

[0025] As an organic alkali metal, for example n-butyl lithium, sec-butyl lithium, Organic mono-lithium compounds, such as t-butyl lithium, hexyl lithium, phenyl lithium, and stilbene lithium; Dilithio methane, Polyfunctional organolithium compounds, such as 1, 4-dilithio butane, 1, 4-dilithio 2-ethylcyclohexane, 1 and 3, and 5-TORIRI thio benzene; sodium naphthalene, potassium naphthalene, etc. are mentioned. Also in these, an organolithium compound is desirable and especially an organic mono-lithium compound is desirable. These organic alkali metals are independent, respectively, or can be used combining two or more sorts.

[0026] As a secondary amine compound, an aliphatic series secondary amine compound, an aromatic series secondary amine compound, an annular imine compound, etc. are mentioned, and they are an aliphatic series secondary amine compound and an annular imine compound preferably, for example.

[0027] As an aliphatic series secondary amine compound, for example Dimethylamine, methylethyl amine, Methylpropyl amine, methylbutyl amine, methyl amylamine, Amyl hexylamine, diethylamine, ethyl propylamine, an ethyl butylamine, Ethylhexyl amine, dipropylamine, diisopropylamine, A propyl butylamine, dibutyl amine, diamylamine, dihexyl amine, Diheptylamine, dioctyl amine, methyl cyclopentyl amine, ethyl cyclopentyl amine, methylcyclohexyl amine, JISHIKURO pentylamine, dicyclohexylamine, etc. are mentioned. Also in these, dimethylamine, methylethyl amine, diethylamine, dipropylamine, diisopropylamine, dibutyl amine, diamylamine, dihexyl amine, diheptylamine, dioctyl amine, etc. are desirable.

[0028] As an aromatic series secondary amine compound, diphenylamine, N-methylaniline, N-ethylaniline, dibenzylamine, N-methylbenzyl amine, N-ethyl phenethylamine, etc. are mentioned, for example.

[0029] As an annular imine compound, for example Aziridine, acetidin, pyrrolidine, Piperidine,

2-methyl piperidine, 3-methyl piperidine, 4-methyl piperidine, 3, 5-dimethyl piperidine, 2-ethyl piperidine, hexamethyleneimine, heptamethyleneimine, dodeca methyleneimine, coniine, morpholine, oxazin, pyrroline, pyrrole, azepine, etc. are mentioned. Also in these, pyrrolidine, piperidine, 3-methyl piperidine, 4-methyl piperidine, 3, 5-dimethyl piperidine, 2-ethyl piperidine, hexamethyleneimine, heptamethyleneimine, etc. are desirable.

[0030] These secondary amine compounds are independent, respectively, or are used combining two or more sorts.

[0031] [the amount] although the amount of the organic alkali metal amide used in the case of using the organic alkali metal amide which an organic alkali metal and secondary amine were made to react beforehand, and was prepared is suitably chosen by the molecular weight of the generation polymer demanded per 100g of monomers -- usually -- it is the range of 0.3 - 10mmol more preferably 0.2 to 15 mmol 0.1 to 30 mmol.

[0032] [the amount] although the amount of the organic alkali metal used in the case of adding an organic alkali metal and secondary amine to a polymerization system, and making organic alkali metal amide generate in a system is suitably chosen by the molecular weight of the generation polymer demanded per 100g of monomers -- usually -- it is the range of 0.3 - 10mmol more preferably 0.2 to 15 mmol 0.1 to 30 mmol. 0.8-1.5Eq of the amount of the secondary amine used at this time is 0.5-2Eq usually 1Eq more preferably to an organic alkali metal.

[0033] As a hydrocarbon system solvent, for example n-butane, n-pentane, iso-pentane, Aliphatic hydrocarbon, such as n-hexane, n-heptane, and iso-octane; Cyclopentane, Alicyclic hydrocarbon, such as cyclohexane and methylcyclopentane; aromatic hydrocarbon [, such as benzene and toluene,]; etc. is chosen from a well-known thing, and is n-hexane, cyclohexane, toluene, etc. preferably. Moreover, you may use low unsaturated hydrocarbon of polymerization nature, such as 1-butene, ****- 2-butene, and 2-hexene, etc. if needed. These hydrocarbon system solvents are independent, or are combined two or more sorts, and are usually used by the quantitative ratio from which monomer concentration becomes 1 weight % - 30weight %.

[0034] If it is generally used as a polar compound in order to adjust the microstructure of a conjugated diene joint unit, and the distribution in the copolymer chain of aromatic vinyl by the usual anionic polymerization, there will be no restriction exceptionally. For example, alkali metal alkoxide, such as ether compound; tertiary amine; potassium t-amyl oxide and potassium t-amyl oxide; phosphine compound [, such as triphenyl phosphine,]; etc. is mentioned. Also in these, since tertiary amine, an ether compound, especially tertiary amine and a diether compound can raise highly the independent joint unit quantity of the amount of vinyl bindings of a conjugated diene joint unit, and aromatic vinyl, they are suitable.

[0035] As tertiary amine, tetramethylethylenediamine, trimethylamine, triethylamine, pyridine,

quinuclidine, etc. are mentioned, for example.

[0036] The mono-ether compound which has one ether linkage in intramolecular as an ether compound, for example, Even if it is classified into the diether compound which has two ether linkages in intramolecular, the multivalent ether compound which has three or more ether linkages in intramolecular, etc. and is which ether compound, there is no restriction in particular, but a diether compound is the most desirable. although limitation in particular is not carried out as for the carbon number of an ether compound -- usually -- 2-100 -- desirable -- 2-50 -- more -- desirable -- 4-20 -- it is the range of 4-15 most preferably.

[0037] As a mono-ether compound, for example Wood ether, diethylether, Diisopropyl ether, dibutyl ether, JIAMIURU ether, JIISO amyl ether, Methylethyl ether, methylpropyl ether, methyl isopropyl ether, Methylbutyl ether, methyl isoamyl ether, ethyl propyl ether, Aliphatic series mono-ether, such as ethyl isopropyl ether and ethyl butyl ether; Anisole, Aromatic series mono-ether, such as phenetole, diphenyl ether, and dibenzyl ether; annular mono-ether [, such as tetrahydrofuran and tetrahydropyran,]; etc. is mentioned. Also in these, aliphatic series mono-ether and annular mono-ether are desirable.

[0038] As a diether compound, an alkylene glycol diether, an annular diether, etc. are mentioned and it is an alkylene glycol diether preferably, for example.

[0039] As an alkylene Greil diether, for example Alkylene glycol dialkyl ether, Alkylene glycol alkyl aryl ether, alkylene glycol diaryl ether, alkylene glycol JIARARU kill ether, etc. are mentioned, and it is alkylene glycol dialkyl ether preferably.

[0040] As an example of an alkylene glycol diether For example, ethylene glycol wood ether, ethylene glycol methylethyl ether, Ethylene glycol diethylether, ethylene glycol dipropyl ether, Ethylene glycol dibutyl ether, ethylene glycol butyl t-butyl ether, Ethylene glycol JIAMIURU ether, ethylene glycol dioctyl ether, Propylene glycol wood ether, propylene glycol wood ether, Propylene glycol diethylether, propylene glycol dibutyl ether, iso propylene glycol wood ether, iso propylene glycol diethylether, butylene glycol wood ether, butylene glycol diethylether, alkylene glycol dialkyl ether [, such as a butylene glycol dibutyl glycol,]; -- alkylene glycol alkyl aryl ether [, such as ethylene glycol methylphenyl ether,]; -- [ethylene glycol diphenyl ether etc. / alkylene glycol JIARI] RUETERU; alkylene glycol JIARARU kill ether [, such as ethylene glycol dibenzyl ether,]; etc. is mentioned. Also in these, ethylene glycol wood ether, ethylene glycol methylethyl ether, Ethylene glycol diethylether, ethylene glycol dipropyl ether, Ethylene glycol dibutyl ether, ethylene glycol butyl t-butyl ether, Ethylene glycol JIAMIURU ether, propylene glycol wood ether, Propylene glycol wood ether, propylene glycol diethylether, Especially propylene glycol dibutyl ether etc. is desirable, and Ethylene glycol wood ether, Ethylene glycol methylethyl ether, ethylene glycol diethylether, ethylene glycol dipropyl ether, ethylene glycol dibutyl ether, ethylene glycol butyl t-butyl ether, ethylene glycol JIAMIURU ether, etc. are the most desirable.

[0041] The dioxolane alkane indicated as an annular diether in dioxane, 1, 10-phenanthroline, etc. and the United States patent gazette No. 4,429,091, for example For example, bis(2-oxo-RANIRU) methane, 2, and 2-bis(2-oxo-RANIRU) propane, 1 and 1-bis(2-oxo-RANIRU) ethane, 2, and 2-bis(5-methyl 2-oxo-RANIRU) propane etc. is mentioned, and dioxane and dioxolane alkane are desirable also in these.

[0042] As a multivalent ether compound, ORIGOOKISHI alkylene glycol dialkyl ether, oxo-RANIRU dioxanes, oxo-RANIRU dioxolanes, and crown ether are mentioned, for example.

[0043] As ORIGOOKISHI alkylene glycol dialkyl ether For example, diethylene glycol wood ether, diethylene glycol methylethyl ether, Diethylene glycol diethyl ether, diethylene glycol dibutyl ether, Diethylene glycol dihexyl ether, triethylene glycol wood ether, A triethylene glycol dipropyl glycol, triethylene glycol dibutyl ether, Oligo oxy-ethylene glycol dialkyl ether, such as tetraethylene glycol diethylether; Dipropylene glycol wood ether, Dipropylene glycol diethylether, dipropylene glycol dipropyl ether, ORIGOOKISHI propylene glycol dialkyl ether [, such as di-isopropylene glycol JIAMIRU ether,]; -- a jib -- ORIGOOKISHI butylene glycol dialkyl ether [, such as CHIREN glycol wood ether,]; etc. is mentioned. Also in these, oligo oxy-ethylene glycol dialkyl ether is desirable. Especially Diethylene glycol wood ether, diethylene glycol diethyl ether, Diethylene glycol dibutyl ether, triethylene glycol wood ether, triethylene glycol dibutyl ether, tetraethylene glycol diethylether, etc. are desirable.

[0044] As polyoxy-alkylene-glycol dialkyl ether For example, polyoxy-ethylene-glycol wood ether, polyoxy-ethylene-glycol diethylether, Polyoxy-ethylene-glycol diisopropyl ether, polyoxy-ethylene-glycol dibutyl ether, Polyoxy ethylene glycol dialkyl ether, such as polyoxy-ethylene-glycol dioctyl ether; Polyoxypropylene glycol wood ether, Polyoxypropylene glycol dialkyl ether, such as polyoxypropylene glycol diethylether; polyoxy butylene glycol dialkyl ether [, such as polyoxy butylene glycol wood ether,]; etc. is mentioned.

[0045] As oxo-RANIRU dioxanes and oxo-RANIRU dioxolanes For example, it is mentioned by the compound indicated to JP,H7-74245,B and specifically For example, 2-(2-oxo-RANIRU) dioxane, 2-(2-oxo-RANIRU)-4, 4, 6-bird methyl dioxane, 2-(5-methyl 2-oxo-RANIRU)-4, 4, 6-bird methyl dioxane, 2-(2-oxo-RANIRU)-5 and 5-dimethyl dioxane, 2-(2-oxo-RANIRU) dioxolane, A 2-(2-oxo-RANIRU)-4-t-butyl oxo-run, 2-(2-oxo-RANIRU)-4, 5-dimethyl dioxolane, 2-(2-oxo-RANIRU)-4, 4 and 5, 5-tetramethyl dioxolane, etc. are mentioned.

[0046] As crown ether, for example 18-crown 6-ether, 15-crown 5-ether, 12-crown 4-ether, dibenzo 18-crown ether, dibenzo 24-crown 8-ether, dicyclohexano-18-crown-6-ether, 4'-nitrobenzo 15-crown 5-ether, etc. are mentioned.

[0047] These polar compounds are independent, respectively, or can be used combining two or more sorts. The range of 0.1-100mol of the amount [0.5-50mol of] of these polar compounds used is 1-30mol most preferably usually preferably [0.05mol or more] to 1mol of organic alkali metal amide (or organic alkali metal) used as an initiator. If there is too little

amount of the polar compound used, the amount of vinyl bindings of a conjugated diene portion cannot be made high enough, and it is not desirable.

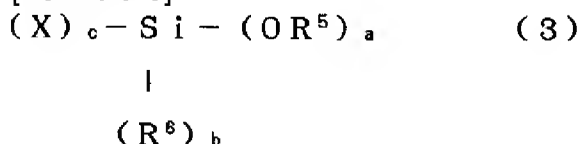
[0048] Although the amount of each monomer used is suitably chosen according to the use of diene rubber, conjugated diene is 40 to 100 weight %, and aromatic vinyl is usually 60 to 0 weight %. [the rate of each monomer in the case of carrying out copolymerization of conjugated diene and the aromatic vinyl] conjugated diene -- usually -- it is 55 to 85 weight % more preferably 50 to 90weight % 40 to 95weight % -- aromatic vinyl -- usually -- it is 45 to 15weight % of a range more preferably 50 to 10weight % 60 to 5weight %.

[0049] A polymerization reaction can be similarly performed, also when using the organic alkali metal amide prepared beforehand, and when making organic alkali metal amide generate in a polymerization reaction system, is the range which is -78-150 degrees C, and is usually performed in polymerization styles, such as a batch process or a continuous system. Moreover, when carrying out copolymerization of the aromatic vinyl, in order to raise the randomness of an aromatic vinyl unit, For example, as indicated to JP,S59-140211,A or JP,S56-143209,A It is desirable to supply continuously or intermittently the mixture of conjugated diene or conjugated diene, and aromatic vinyl to the system of reaction so that the aromatic vinyl content in aromatic vinyl in a polymerization system and the composition ratio of conjugated diene may become a specific concentration range.

[0050] The activity polymer which has the 3rd class amino group at the start end of a polymer chain, and has an organic alkali metal at the polymer chain end of the other end by the above-mentioned polymerization reaction is obtained. As an example of a polymer chain, polybutadiene, polyisoprene, a butadiene isoprene copolymer, a styrene butadiene copolymer, a styrene isoprene copolymer, a styrene butadiene isoprene copolymer, etc. can be illustrated, for example.

[0051] As this activity polymer and an alkoxysilane compound made to react, it is a general formula (3), for example.

[Formula 3]



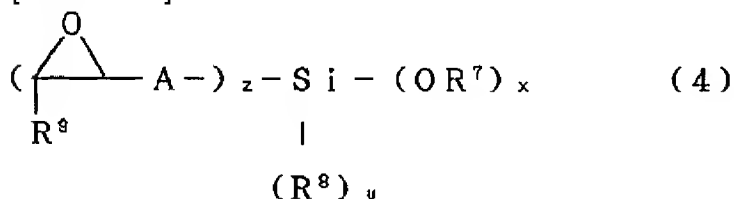
the alkyl group in which R5 and R6 may have a substituent among a formula, and the cycloalkyl machine which may have a substituent -- The integer of 1-4 and b show the integer of 0-3, c shows the integer of 0-3, and, as for the aralkyl machine which may have the aryl group which may have a substituent, or a substituent, and X, a+b+c shows four, as for a halogen atom and a. It is expressed.

[0052] R5 in a general formula (3), and the carbon number of R6 -- usually -- 1-20 -- desirable - - 1-15 -- it is the range of 1-10 more preferably. R5 and R6 are the alkyl groups which may

show the alkyl group which may have a substituent, the cycloalkyl machine which may have a substituent, the aryl group which may have a substituent, and the aralkyl machine which may have a substituent, and may have a substituent independently preferably, respectively. As a substituent of an alkyl group, a cycloalkyl machine, an aryl group, and an aralkyl machine If a reaction is not checked, there will be no exceptional restriction and For example, a halogen atom, A nitro group, hydroxyl, an alkoxy group (and an alkyl group; in the case of a cycloalkyl machine, an aryl group, and an aralkyl machine), etc. are mentioned, it is a halogen atom, a nitro group, an alkoxy group, etc. preferably, and they are a halogen atom and a nitro group more preferably. As an alkyl group, for example A methyl group, an ethyl group, a propyl group, an isopropyl group, A n-butyl machine, sec-butyl, tert-butyl, a n-amyl machine, An isoamyl machine, a n-hexyl machine, a n-octyl machine, n-dodecyl, n-octadecyl machine etc. is mentioned and also in these A methyl group, an ethyl group, Low-grade alkyl groups, such as a propyl group, an isopropyl group, a n-butyl machine, sec-butyl, tert-butyl, a n-amyl machine, an isoamyl machine, and a n-hexyl machine, etc. are desirable, and a methyl group, an ethyl group, n-propyl group, especially a n-butyl machine, etc. are desirable. As a cycloalkyl machine, a cyclopentyl group, 2-methyl cyclopentyl group, a cyclohexyl machine, etc. are mentioned, for example. As an aryl group, a phenyl group, the phenyl group of low-grade alkyl-group displacement, a naphthyl group, a biphenyl machine, etc. are mentioned, and they are a phenyl group and the phenyl group of low-grade alkylation preferably, for example. As an aralkyl machine, benzyl, a phenethyl machine, the benzyl of low-grade alkyl-group displacement, etc. are mentioned, for example. As X in a general formula (3), a chlorine atom, a bromine atom, an iodine atom atom, etc. are mentioned.

[0053] As an example of an alkoxysilane compound, the compound indicated by JP,H7-233216,A is used, for example. For example, tetramethoxy silane, tetra-ethoxy silane, tetra-propoxysilane, Tetra-alkoxysilane compounds, such as tetra-butoxysilane, tetra-phenoxy silane, and TETORATORU yloxy silane; Methyl trimethoxysilane, Methyltriethoxysilane, methyl tripropoxy silane, methyl bird butoxysilane, Methyl triphenoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, Ethyl tripropoxy silane, ethyl bird butoxysilane, ethyl triphenoxysilane, Dimethyldimethoxysilane, dimethyldiethoxysilane, dimethyl dipropoxy silane, Dimethyl dibutoxysilane, JIMECHIRUJI phenoxy silane, diethyldimethoxysilane, Diethyldiethoxysilane, diethyl dipropoxy silane, diethyl dibutoxysilane, Alkyl alkoxysilane compounds, such as JIECHIRUJI phenoxy silane; vinyl trimethoxy SHIRANN, vinyltriethoxysilane, vinyl tripropoxy silane, vinyl bird butoxysilane, vinyl triphenoxysilane Allyl compound trimethoxysilane, OKUTE nil trimethoxysilane, divinyl dimethoxysilane, Alkenyl ARUKOSHIKI gardenia fruit run compounds, such as a styryl TOSHIMETOKI gardenia fruit run; Phenyltrimethoxysilane, Phenyltriethoxysilane, phenyl tripropoxy silane, phenyl bird butoxysilane, Aryl alkoxysilane compounds, such as phenyl triphenoxysilane; Trimethoxy chlorosilane, Bird ethoxy

chlorosilane, tripropoxy chlorosilane, bird butoxy chlorosilane, Triphenoxy chlorosilane, dimethoxy dichlorosilane, dipropoxy dichlorosilane, JIFENOKISHI dichlorosilane, methoxy trichlorosilane, ethoxytrichlorosilane, Propoxy trichlorosilane, phenoxy trichlorosilane, trimethoxy bromo silane, Bird ethoxy bromo silane, tripropoxy bromo silane, triphenoxy bromo silane, Dimethoxy dibromo silane, diethoxy dibromo silane, JIFENOKISHI dibromo silane, methoxy tribromo silane, ethoxy tribromo silane, propoxy tribromo silane, phenoxy tribromo silane, trimethoxy iodine silane, Bird ethoxy iodine silane, tripropoxy iodine silane, triphenoxy iodine silane, Dimethoxy diiodo silane, diethoxy diiodo silane, dipropoxy iodine silane, MECHIKISHI triiodo silane, ethoxy triiodo silane, propoxy triiodo silane, Halogeno alkoxysilane compounds, such as phenoxy triiodo silane; beta-chloro ethyl methyl dimethoxysilane, Halogeno alkyl alkoxysilane compounds, such as gamma-chloropropyl methyl dimethoxysilane; nitro alkyl alkoxysilane compound [, such as beta-nitroglycerine ethyl methyl dimethoxysilane and gamma-nitroglycerine propylmethyl dimethoxysilane,]; etc. is mentioned. [0054] If it is the compound which has at least one epoxy group and at least one alkoxy group in intramolecular as an activity polymer and an epoxy group content alkoxysilane compound made to react, there will be no restriction in particular, for example, it is a general formula (4). [Formula 4]



The alkyl group in which R7 and R8 may have a substituent among [type, the cycloalkyl machine which may have a substituent, The aralkyl machine which may have the aryl group which may have a substituent, or a substituent, The cycloalkyl machine which may have a hydrogen atom, the alkyl group in which you may have a substituent, and a substituent R9, The aralkyl machine which may have the aryl group which may have a substituent, or a substituent, A is alkylene group, arylene machine, alkylene arylene machine, arylene alkylene group, or general formula (5)-A1-O-A2. - (among a formula) A1 and A2 show an alkylene group, an arylene machine, an alkylene arylene machine, or an arylene alkylene group. As for a machine and x, the integer of 1-3 and y show the integer of 0-2, z shows the integer of 1-3, x+y+z shows four, and A and R9 may form a ring system unitedly. It is expressed with]. [0055] As a substituent of the alkyl group of R7 of a general formula (4), R8, and R9, a cycloalkyl machine, an aryl group, and an aralkyl machine If a reaction is not checked, there will be no exceptional restriction and For example, a halogen atom, A nitro group, hydroxyl, an alkoxy group (and an alkyl group; in the case of a cycloalkyl machine, an aryl group, and an aralkyl machine), etc. are mentioned, it is a halogen atom, a nitro group, an alkoxy group, etc.

preferably, and they are a halogen atom and a nitro group more preferably.

[0056] R7 in a general formula (4), and the carbon number of R8 -- usually -- 1-20 -- desirable -- 1-15 -- it is the range of 1-10 more preferably. R7 and R8 show independently an alkyl group, a cycloalkyl machine, an aryl group, and an aralkyl machine, respectively, and they are an alkyl group preferably. As an alkyl group, for example A methyl group, an ethyl group, a propyl group, an isopropyl group, A n-butyl machine, sec-butyl, tert-butyl, a n-amyl machine, An isoamyl machine, a n-hexyl machine, a n-octyl machine, n-dodecyl, n-octadecyl machine etc. is mentioned and also in these A methyl group, an ethyl group, Low-grade alkyl groups, such as a propyl group, an isopropyl group, a n-butyl machine, sec-butyl, tert-butyl, a n-amyl machine, an isoamyl machine, and a n-hexyl machine, etc. are desirable, and a methyl group, an ethyl group, n-propyl group, especially a n-butyl machine, etc. are desirable. As a cycloalkyl machine, a cyclopentyl group, 2-methyl cyclopentyl group, a cyclohexyl machine, etc. are mentioned, for example. As an aryl group, a phenyl group, the phenyl group of low-grade alkyl-group displacement, a naphthyl group, a biphenyl machine, etc. are mentioned, and they are a phenyl group and the phenyl group of low-grade alkylation preferably, for example. As an aralkyl machine, benzyl, a phenethyl machine, the benzyl of low-grade alkyl-group displacement, etc. are mentioned, for example.

[0057] R9 in a general formula (4) shows a hydrogen atom, an alkyl group, a cycloalkyl machine, an aryl group, or an aralkyl machine, and is a hydrogen atom or an alkyl group preferably. a carbon number in case R9 is an alkyl group, a cycloalkyl machine, an aryl group, or an aralkyl machine -- usually -- 1-20 -- desirable -- 1-15 -- it is the range of 1-10 more preferably. As an alkyl group, for example A methyl group, an ethyl group, a propyl group, an isopropyl group, A n-butyl machine, sec-butyl, tert-butyl, a n-amyl machine, An isoamyl machine, a n-hexyl machine, a n-octyl machine, n-dodecyl, n-octadecyl machine etc. is mentioned and also in these A methyl group, an ethyl group, Low-grade alkyl groups, such as a propyl group, an isopropyl group, a n-butyl machine, sec-butyl, tert-butyl, a n-amyl machine, an isoamyl machine, and a n-hexyl machine, etc. are desirable, and a methyl group, an ethyl group, n-propyl group, especially a n-butyl machine, etc. are desirable. As a cycloalkyl machine, a cyclopentyl group, 2-methyl cyclopentyl group, a cyclohexyl machine, etc. are mentioned, for example. As an aryl group, a phenyl group, the phenyl group of low-grade alkyl-group displacement, a naphthyl group, a biphenyl machine, etc. are mentioned, and they are a phenyl group and the phenyl group of low-grade alkylation preferably, for example. As an aralkyl machine, benzyl, a phenethyl machine, the benzyl of low-grade alkyl-group displacement, etc. are mentioned, for example.

[0058] the carbon number of A in a general formula (4) -- usually -- 1-20 -- desirable -- 1-15 -- it is the range of 1-10 more preferably. A is alkylene group, arylene machine, alkylene arylene machine, arylene alkylene group, or general formula (5)-A1-O-A2. - (among a formula) A1 and

A2 show an alkylene group, an arylene machine, an alkylene arylene machine, or an arylene alkylene group. It is the joint machine with which it is expressed, and is the joint machine preferably expressed with an alkylene group or a general formula (5).

[0059] As an alkylene group, low-grade alkylene groups, such as a methylene group, ethylene, n-propylene machine, an iso propylene machine, n-butylene group, an isobutylene machine, a sec-butylene group, a tert-butylene group, and n-hexylene machine, etc. are mentioned as a desirable example, for example. As an arylene machine, 1, 2-phenylene group, 1, 3-phenylene group, 1, and 4-phenylene group etc. may be mentioned, and some hydrogen atoms may be replaced by the low-grade alkyl group, for example. As an alkylene arylene machine, an arylene alkylene group, etc., low-grade alkylene groups, such as methylene, ethylene, propylene, iso propylene, and butylene, the joint machine with which Feni Wren, Feni Wren by whom the low-grade alkyl group was replaced, etc. were put together, etc. are mentioned, for example.

[0060] A1 in general formula (5)-A1-O-A2- and illustration of A2 are the same as that of the example of the alkylene group of Above A, an arylene machine, an alkylene arylene machine, or an arylene alkylene group.

[0061] As an example of a joint machine expressed with general formula (5)-A1-O-A2- For example, an alkyleneoxy alkylene group, an alkylene arylene oxyalkylene machine, An alkyleneoxy arylene machine, an alkylene arylene oxy-arylene machine, An arylene oxyalkylene machine, an arylene alkyleneoxy alkylene group, An arylene oxy-arylene machine, an arylene alkyleneoxy arylene machine, An alkyleneoxy arylene alkylene group, an alkylene ARIRENOKISHI arylene alkylene group, An arylene alkyleneoxy arylene alkylene group, an alkyleneoxy alkylene arylene machine, an alkylene arylene oxyalkylene arylene machine, an arylene alkyleneoxy alkylene arylene machine, etc. are mentioned. Also in these, an alkyleneoxy alkylene group, an alkyleneoxy arylene machine, an arylene oxyalkylene machine, an arylene oxy-arylene machine, etc. are desirable, and an alkyleneoxy alkylene group is the most desirable.

[0062] As an alkyleneoxy alkylene group, for example A methylene oxy-methylene group, Low-grade alkyleneoxy low-grade alkylene groups, such as a methylene oxyethylene machine, a methylene oxypropylene machine, ethyleneoxy ethylene, and an ethyleneoxy butylene group, etc. are mentioned as a desirable example. As an alkyleneoxy arylene machine, a methylene OKISHIFE Nylen machine, an ethyleneoxy Feni Wren machine, a propyleneoxy Feni Wren machine, etc. are mentioned, for example. As an arylene oxyalkylene machine, the Feni RENOKISHI methylene group, a Feni RENOKISHI iso propylene machine, the Feni RENOKISHI butylene group, etc. are mentioned. What the Feni Wren machine with which some of Feni Wren machines and hydrogen atoms were replaced by the low-grade alkyl group combined by the oxy-group as an arylene oxy-arylene machine, for example is mentioned. As

an arylene alkyleneoxy alkylene group, the Feni REMMECHIREN oxy-methylene group, the Feni RENECHIREN oxyethylene machine, etc. are mentioned, for example.

[0063] the ring system which R9 and A in a general formula (4) combined mutually -- usually -- 4 - 12 membered-ring structure -- desirable -- 5 - 10 membered-ring structure -- it is 5 - 8 membered-ring structure more preferably. For example, a cyclobutane ring, a cyclopentane ring, a cyclohexane ring, a cycloheptane ring, a cyclooctane ring, etc. are mentioned, also in these, a cyclopentane ring, a cyclohexane ring, etc. are desirable and, specifically, a cyclohexane ring is the most desirable.

[0064] As an example of an epoxy group content alkoxysilane compound, the compound indicated by JP,H7-233217,A can be used, for example. Specifically, for example 3-glycidoxy ethyl trimethoxy silane, 3-glycidoxybutyl propyltrimethoxysilane, 3-glycidoxybutyl trimethoxysilane, 3-glycidoxy propyl tripropoxy silane, 3-glycidoxy propyl bird butoxysilane, 3-glycidoxy propyl triphenoxysilane, 3-glycidoxy propyl triphenoxysilane, 3-glycidoxypropyl ethyl dimethoxysilane, 3-glycidoxy propylethyl diethoxysilane, 3-glycidoxy propylethyl diethoxysilane, 3-glycidoxy propyl methyldiethoxysilane, 3-glycidoxy propylmethyl dipropoxy silane, 3-glycidoxy propylmethyl JIFENOKISHI silane, 3-glycidoxy propyl dimethyl methoxysilane, 3-glycidoxy propyl diethyl ETOKISHISHIRAN, 3-glycidoxy propyl dimethylethoxy silane, 3-glycidoxy PUROPIRUJI methylphenoxy silane, 3-glycidoxy propyl diethyl methoxysilane, 3-glycidoxy propylmethyl JIISOPUROPENOKISHI silane, bis(3-glycidoxy propyl) dimethoxysilane, Bis(3-glycidoxy propyl) diethoxysilane, bis(3-glycidoxy propyl) dipropoxy silane, Bis(3-glycidoxy propyl) dibutoxysilane, a bis(3-glycidoxy propyl) JIFENOKI gardenia fruit run, Bis(3-glycidoxy propyl) methyl methoxysilane, bis(3-glycidoxy propyl) methylethoxy silane, Bis(3-glycidoxy propyl) methyl propoxysilane, bis(3-glycidoxy propyl) methyl butoxysilane, Bis(3-glycidoxy propyl) methylphenoxy silane, tris (3-glycidoxy propyl) methoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl trimethoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl triethoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl tripropoxy silane, beta-(3, 4-epoxycyclohexyl) ethyl bird butoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl triphenoxysilane, beta-(3, 4-epoxycyclohexyl) propyl trimethoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl methyl dimethoxysilane beta-(3, 4-epoxycyclohexyl) ethyl ethyl dimethoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl ethyldiethoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl methyldiethoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl methyl dipropoxy silane, beta-(3, 4-epoxycyclohexyl) ethyl methyl dibutoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl MECHIRUJI phenoxy silane, beta-(3, 4-epoxycyclohexyl) ethyl dimethyl methoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl diethyl ethoxy silane, beta-(3, 4-epoxycyclohexyl) ethyl dimethylethoxy silane, beta-(3, 4-epoxycyclohexyl) ethyl dimethyl propoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl dimethyl butoxysilane, beta-(3, 4-epoxycyclohexyl) ethyl dimethyl phenoxy silane, beta-(3, 4-epoxycyclohexyl) ethyl diethyl

methoxysilane, beta-(3, 4-epoxycyclohexyl) *****_***** propene oxy-silane 2, 3-epoxy propylmethyl dimethoxysilane, 3, 4-epoxy butyl methyl dimethoxysilane, 4, 5-epoxy heptyl methyl dimethoxysilane, 4, 5-epoxy heptyl ethyl dimethoxysilane, 5, and 6-epoxy hexyl methyl dimethoxysilane etc. is mentioned.

[0065] [these alkoxysilane compound and an epoxy group content alkoxysilane compound] It can be used combining independent or two sorts or more, respectively, and as for the amount used, organic alkali metal amide (or organic alkali metal) hits, and the range of it is usually 1-2Eq 1-5Eq 1-10Eq preferably 1Eq or more.

[0066] The reaction of an activity polymer, the above-mentioned alkoxysilane compound, and/or an epoxy group content alkoxysilane compound can be performed by adding this compound after the end of a polymerization reaction. 0-200 degrees C of reaction temperature is usually 20-150 degrees C preferably -- reaction time -- usually -- they are 10 minutes - 2 hours more preferably for 1 minute - 5 hours for 30 seconds - 10 hours.

[0067] In addition, it is proved by JP,H7-233216,A, JP,H7-233217,A, etc., for example that an alkoxy silyl machine is introduced into a polymer chain at a reaction with these activity polymers and alkoxysilane compounds, and/or an epoxy group content alkoxysilane compound.

[0068] After adding alcohols, such as methanol and isopropanol, as a stopper, suspending a polymerization reaction and adding an antioxidant and a crumb-ized agent after the above-mentioned end of a reaction, a solvent can be removed by methods, such as direct drying, and generation polymers can be collected.

[0069] What contains the diene rubber which has the above-mentioned amino group and an alkoxy silyl machine as a rubber component of the rubber constituent of rubber component this invention is used. Although this amino group in a rubber component and the rate of alkoxy silyl machine content diene rubber are suitably chosen according to the purpose of use, they are usually 25 to 100 weight % 20 to 100weight % 15 to 100weight % preferably 10weight % or more. If there are too few these amino groups of this invention in a rubber component and rates of alkoxy silyl machine content diene rubber, the effect of modification is not enough and desirable.

[0070] Although there is no limitation in particular as rubber of others which can be used together, diene rubber is usually used. As diene rubber, for example Natural rubber (NR), polyisoprene rubber (IR), Emulsion-polymerization styrene butadiene rubber (SBR), solution-polymerization random SBR ([5 to 50 weight % of combined styrene]) 1 of a butadiene joint unit portion, 10 to 80% of the amount of 2-vinyl bindings, the high transformer SBR (1 of a butadiene joint unit portion, 70 to 95% of the amount of 4-transformer bindings) low cis polybutadiene rubber -- (-- [it high-cis-/ BR(ing)) / BR(s), high-transformer-BR(s) (1 of a butadiene joint unit portion, 70 to 95% of the amount of 4-transformer bindings), and] Styrene

isoprene rubber (SIR), butadiene isoprene copolymer rubber, Solution-polymerization random styrene butadiene isoprene copolymerization rubber (SIBR), The emulsion polymerization SIBR, emulsion-polymerization styrene acrylonitrile butadiene copolymerization rubber, Block copolymers, such as acrylonitrile butadiene copolymerization rubber, high vinyl SBR-low vinyl SBR block copolymerization rubber, and a polystyrene polybutadiene polystyrene block copolymer, etc. are mentioned, and it can choose suitably according to prescribed properties. Also in these, NR, BR, IR, SBR, SIBR, etc. are desirable. The rubber of these others is independent, respectively, or can be used combining two or more sorts.

[0071] Although there is no restriction in particular as a reinforcer reinforcer, silica, carbon black, etc. can be used, for example.

[0072] Although there is no restriction in particular as silica, dry process white carbon, wet method white carbon, colloidal silica, the precipitated silica indicated by JP,S62-62838,A, etc. are mentioned, for example. Also in these, especially the wet method white carbon that uses water silicic acid as a principal component is desirable. These silica is independent, respectively or can be used combining two or more sorts.

[0073] The specific surface area of silica is nitrogen adsorption specific surface area (BET adsorption method), although restriction in particular is not carried out. Usually, 50-400m²/g]2, preferably, 100-220m²/g and when it is the range of 120-190m²/g still more preferably, an improvement reinforcement nature, wear-resistant, febrile is fully attained, and it is suitable. Nitrogen adsorption specific surface area is a value measured by a BET adsorption method according to ASTM D3037-81 here.

[0074] Although there is no restriction in particular as carbon black, furnace black, acetylene black, thermal black, channel black, graphite, etc. can be used, for example. Also in these, especially furnace black is desirable and the thing of various grades, such as SAF, ISAF, ISAF-HS, ISAF-LS, IISAF-HS, HAF, HAF-HS, HAF-LS, and FEF, is mentioned as the example. These carbon black is independent, respectively, or can be used combining two or more sorts.

[0075] Preferably, 50-150m²/g and when it is the range of 80-130m²/g more preferably, tensile strength and abrasion resistance are usually improved on a high level 5-200m²/g]2, and the nitrogen adsorption specific surface area (N2SA) of carbon black is suitable, although there is no restriction in particular. moreover -- although the DBP amount of adsorption of carbon black does not have restriction in particular -- usually -- 5-300ml/-- tensile strength and abrasion resistance are improved on a high level, and 100g is preferably suitable, 50-200ml / when 100g is the range of 80-160ml / 100g more preferably.

[0076] As carbon black The adsorption (CTAB) specific surface area of the Sept Iles trimethylammonium star's picture indicated by JP,H5-230290,A by 110-170m²/g 24, Abrasion resistance is further improvable when DBP (24M4DBP) oil absorption after applying repetition compression 4 times by the pressure of 000psi uses high structure carbon black which is 110-

[0077] the blending ratio of coal of a reinforcer receives a rubber component 100 weight part -- a 10 - 200 weight part -- desirable -- a 20 - 150 weight part -- it is a 30 - 120 weight part more preferably.

[0078] In order to attain the purpose of this invention highly, as a reinforcer, it is silica independent or it is desirable to use together and use silica and carbon black. although the mixed rate in the case of using silica and carbon black together is suitably chosen according to a use or the purpose -- usually -- silica:carbon black =10:90 - 99:1 -- desirable -- 30:70-95:5 -- it is 50:50-90:10 (bulk density) more preferably.

[0079] Since febrility and abrasion resistance will be further improved if a silane coupling agent is added in silane coupling agent this invention, it is suitable.

[0080] Although there is no limitation in particular as a [REDACTED] for example Vinyl trichlorosilan, Vinyltriethoxysilane, vinyl tris (beta-methoxyethoxy) Silang, beta-(3, 4-epoxycyclohexyl) ethyltrimethoxysilane, Gamma-glycidoxypropyltrimetoxysilane, gamma-methacryloxpropyl trimethoxy silane, N-(beta-aminoethyl)-gamma-aminopropyl trimethoxysilane, N-(beta-aminoethyl)-gamma-aminopropyl methyl dimethoxysilane, N-phenyl gamma-aminopropyl trimethoxysilane, gamma-chloropropyltrimetoxysilane, gamma-mercapto propyltrimethoxysilane, gamma-aminopropyl triethoxysilane, Bis(3-(triethoxy silyl) propyl) tetrasulfide and gamma-trimethoxysilylpropyl dimethyl thio carbamyl tetrasulfide indicated to JP,H6-248116,A, Tetrasulfide, such as gamma-trimethoxysilylpropyl benzothiazyl tetrasulfide, can be mentioned.

[0081] These silane coupling agents are independent, respectively, or can be used combining two or more sorts. the blending ratio of coal of a silane coupling agent receives a silica 100 weight part -- usually -- 0.1 - 30 weight part -- desirable -- 1 - 20 weight part -- it is the range of 2 - 10 weight part still more preferably.

[0082] The rubber constituent of rubber constituent this invention can carry out the required quantity content of the compounding agent of others, such as a vulcanizing agent, a vulcanization accelerator, a vulcanization activator, an age resistor, an activator, a plasticizer, lubricant, and a bulking agent, according to a conventional method, respectively in addition to the above-mentioned component.

[0083] Although there is no limitation in particular as a vulcanizing agent, for example Powder sulfur, precipitated sulfur, Sulfur, such as colloidal sulphur, insoluble sulfur, and high dispersion nature sulfur; Sulfur monochloride, Halogenation sulfur, such as sulfur dichloride; Organic peroxide; p-quinonedioxime, such as JIKUMIRU peroxide and di-tertiary-butyl peroxide, Quinonedioxime, such as p and p'-dibenzoyl quinonedioxime; Triethylenetetramine, Organic polyamine compounds, such as hexamethylenediamine carbamate, 4, and 4'-methylene ****-o-chloroaniline; alkylphenol resin; with a methylol group etc. is mentioned, also in these, sulfur

is desirable and especially powder sulfur is desirable. These vulcanizing agents are independent, respectively, or are used combining two or more sorts.

[0084] the blending ratio of coal of a vulcanizing agent receives a rubber component 100 weight part -- usually -- 0.1 - 15 weight part -- desirable -- 0.3 - 10 weight part -- it is the range of 0.5 - 5 weight part still more preferably. When the blending ratio of coal of a vulcanizing agent is in this range, while excelling in tensile strength or abrasion resistance, especially since it excels also in characteristics, such as a heat-resisting property and a residual strain, it is desirable.

[0085] As a vulcanization accelerator, for example N-cyclohexyl 2-benzothiazole sulfenamide, N-t-butyl 2-benzothiazole sulfenamide, N-oxyethylene 2-benzothiazole sulfenamide, Sulfenamide system vulcanization accelerators, such as N-oxyethylene 2-benzothiazole sulfenamide, N, and N'-diisopropyl 2-benzothiazole sulfenamide; Diphenylguanidine, Guanidine system vulcanization accelerators, such as JIORUTO tolyl guanidine and alt.bird kana guanidine; Thiocarbanilide, JIORUTO tolyl thiourea, ethylene thiourea, diethyl thiourea, Thiourea system vulcanization accelerators, such as bird methyl thiourea; 2-mercaptobenzothiazole, Dibenzothiazyl disulfide, 2-mercaptobenzothiazole zinc salt, 2-mercaptobenzothiazole sodium salt, 2-mercaptobenzothiazole cyclohexylamine salt, Thiazole system vulcanization accelerators, such as 2-(2, 4-dinitro phenylthio) benzothiazole; tetramethylthiurammonosulfide, tetramethylthiuramdisulfide, a tetraethylthiuram disulfide, Thiuram system vulcanization accelerators, such as tetrabutylthiuram disulfide and dipentamethylenethiuramtetrasulfide; Sodium dimethyldithiocarbamate, Sodium diethyldithiocarbamate, di-n-butyl dithiocarbamic acid sodium, Dimethyl dithiocarbamic acid lead, zinc dimethyldithiocarbamate, Zinc diethyldithiocarbamate, di-n-butyl dithiocarbamic acid zinc, Pentamethylene dithiocarbamic acid zinc, ethyl phenyl dithiocarbamic acid zinc, Diethyldithiocarbamic acid tellurium, dimethyl dithiocarbamic acid selenium, Diethyldithiocarbamic acid selenium, dimethyl dithiocarbamic acid copper, Ferric dimethyl dithiocarbamate, diethyldithiocarbamic acid diethylamine, Dithiocarbamic acid system vulcanization accelerators, such as pentamethylene dithiocarbamic acid piperidine and methyl pentamethylene dithiocarbamic acid PIPEKORIN; Sodium isopropylxanthate, Vulcanization accelerators, such as xanthogenic acid system vulcanization accelerator [, such as zinc isopropylxanthate and zinc butylxanthate,],, are mentioned.

[0086] Although these vulcanization accelerators are independent, respectively or are used combining two or more sorts, especially its thing that contains a sulfenamide system vulcanization accelerator at least is desirable. the blending ratio of coal of a vulcanization accelerator receives a rubber component 100 weight part -- usually -- 0.1 - 15 weight part -- desirable -- 0.3 - 10 weight part -- it is the range of 0.5 - 5 weight part still more preferably.

[0087] Although there is no restriction in particular as a vulcanization activator, higher fatty

acids, zinc oxide, etc., such as stearic acid, can be used, for example. As zinc oxide, it is desirable to, use a thing with a high grain size of 5 micrometers or less of surface activity for example, and a grain size can mention a 0.05-0.2 micrometer active white, 0.3-1-micrometer zinc white, etc. as this example, for example. Moreover, what carried out the surface treatment with the dispersant and wetting agent of an amine system can be used for zinc oxide.

[0088] These vulcanization activators are independent, respectively, or two or more sorts can be used together and used for them. The blending ratio of coal of a vulcanization activator is suitably chosen by the kind of vulcanization activator. receiving a rubber component 100 weight part, when using a higher fatty acid -- usually -- 0.05 - 15 weight part -- desirable -- 0.1 - 10 weight part -- it is 0.5 - 5 weight part more preferably. receiving a rubber component 100 weight part, when using zinc oxide -- usually -- 0.05 - 10 weight part -- desirable -- 0.1 - 5 weight part -- it is 0.5 - 2 weight part more preferably. When the blending ratio of coal of zinc oxide is in this range, characteristics, such as workability, tensile strength, and abrasion resistance, balance highly, and are suitable.

[0089] As an example of other compounding agents, bulking agent; process oils, such as activator; calcium carbonate, such as coupling agent; diethylene glycol other than a silane coupling agent, polyethylene glycol, and silicone oil, a talc, and Clay, a wax, etc. are mentioned, for example.

[0090] The rubber constituent of this invention can be obtained by kneading each component according to a conventional method. For example, after mixing a rubber component with a vulcanizing agent and the compounding agent except a vulcanization accelerator, a vulcanizing agent and a vulcanization accelerator can be mixed into the mixture, and a rubber constituent can be obtained. the mixing temperature of a vulcanizing agent, a vulcanization accelerator, the compounding agent to remove, and a rubber component -- usually -- 80-200 degrees C, it is 140-180 degrees C still more preferably, and mixing time is 30 seconds or more, and is usually for 1 to 30 minutes preferably 100-190 degrees C. The mixing of a vulcanizing agent and a vulcanization accelerator can usually obtain preferably 120-200 degrees C of rubber constituents [100 degrees C or less of] of this invention which carried out press cure at the temperature of 140-180 degrees C a cooling backward crack and after that to room temperature -80 degree C.

[0091]

[Example] The example of manufacture, a work example, and a comparative example are given to below, and it explains more concretely about this invention. The part in these examples and % are weight bases as long as there is no notice especially. Measurement of various kinds of physical properties was performed according to the following method.

(1) The amount of combined styrene in a polymer is JIS. It measured according to K6383 (refractive index method).

- (2) The vinyl joint rate of the butadiene joint unit in a polymer was measured by infrared spectroscopy (Hampton technique).
- (3) The amount of the 3rd class amino group content monomers in a polymer dissolved the copolymer in tetra-hydrone furan, performed reprecipitation coagulation twice with methanol/acetone (50/50mol %), and measured it by 500MHz¹ H-NMR after suction drying.
- (4) The weight average molecular weight (Mw) and number average molecular weight (Mn) of the polymer were measured by GPC, and calculated the weight average molecular weight and number average molecular weight of standard polystyrene conversion.
- (5) -- the styrene chain distribution in a copolymer -- the collection of Society of Polymer Science, Japan drafts -- performing GPC measurement, after carrying out the ozonolysis of the copolymer according to the method indicated to the 2055th page of the 9 volume [29th] No. -- the simple chain (S1) of one styrene unit, And the rate of the long chain (S8) that eight or more styrene units stood in a row was computed.
- (6) Tensile strength is JIS. According to K6301, the stress (Kgf/cm²) modulus was measured 300%. These characteristics were expressed as the index (tensile strength index).
- (7) Using RDA-II by REOMETO Rix Corp., febrility was twisted 1% and measured tan(20Hz and 60 degrees C) delta. These characteristics were expressed as the index (tandelta60 degree C index).
- (8) Abrasion resistance is ASTM. According to D2228, it measured using the pico abrader. These characteristics were expressed as the index (abrasion proof index).
- (9) Workability evaluated the coiling-round nature and ear form to the roll by the following basis, and at the totaling point, they were ranked as five ranks of A-E and it judged them. (A totaling point is [many high degrees] desirable) .
 A; 9-10-point, B; 7-8-point, C; 5-6-point, D; 3-4-point, and sex:5with E; 2 point ** roll; -- 4; which coils finely -- 1; with much [although 2; coiled] frequency where it comes floating which comes floating slightly and as for which 3; half grade comes floating -- it hardly coils.
 ** ear form: -- 5; -- linear -- and smoothness and 4; -- 3; which splits finely slightly although it is linear -- although it is linear, 1; linearity in which about a half splits finely and which 2; lenticulates up and is partially torn to pieces is lost, and is torn to pieces in almost all portions
 [0092] To the example 1 of manufacture - an autoclave with 5 agitators, it is Cyclohexane 8000g, After putting in Styrene 250g and Butadiene 750g and teaching tetramethylethylenediamine (TMEDA) 20 millimole and G n-hexylamine 13 millimole, n-butyl lithium 13 millimole was added and the polymerization was started at 50 degrees C. 10 minutes after the polymerization start, the styrene 150g of the remainder and Butadiene [850g] mixture was added continuously. After checking that the polymerization invert ratio has become 100%, gamma-chloropropyl-methyl-dimethoxysilane (Cl-Si) 13 millimole addition was carried out, and it was made to react for 30 minutes. After adding 20 millimoles of methanol as

a stopper after the end of a reaction and adding 20g of 2 and 6-G t-butylphenol, polymers were collected by the steam stripping method and diene rubber No.1 was obtained. The description of diene rubber was measured and the result was shown in Table 1. Like diene rubber No.1, diene rubber No.2 - 5 were obtained on polymerization conditions given in Table 1, and the description of these polymers was shown in Table 1.

[0093]

[Table 1]

ジエン系No.	1	2	3	4	5
重合条件					
スチレン仕込量(g)	250	220	200	400	400
ブタジエン仕込量(g)	750	780	850	1600	600
DHA(mmol) (*1)	13	13	12	12	14
後添加スチレン量(g)	150	170	100	0	400
後添加ブタジエン量(g)	850	830	900	0	400
温度min(°C)	50	50	40	50	50
温度max(°C)	70	70	70	90	80
n-ブチルアミン量(mmol)	13	13	12	12	14
極性物の種類 (*2)	TMEDA	TMEDA	EGDBE	THF	THF
極性物(mmol)	20	20	20	700	1,000
変性剤の種類 (*3)	Cl-Si	EPO-Si	NO-Si	EPO-Si	-
変性剤(mmol)	13	13	12	12	-
ポリマー特性					
結合スチレン量(wt%)	20.2	20.1	15.4	20.5	40.5
1,2-ビニル量(%)	63.3	62.8	72.5	50.1	49.2
SI(%) (*4)	80.2	73.2	90.5	62.1	48.4
SB(%) (*5)	0.7	0.9	0.1	3.8	2.5
Mn(×10 ⁴)	30.9	33.6	52.9	33.5	21.4

[0094] G n-hexylamine (*2) TMEDA; (*1) Tetramethylethylenediamine, EGDBE; ethylene glycol JIBUCHI ether, THF; Tetrahydrofuran (*3) Cl-Si;gamma-chloropropyl methyl dimethoxysilane, Content of the long chain with which eight or more content (*5) styrene units of one independent chain were connected by EPO-Si;4, 5-epoxy heptyl methyl dimethoxysilane, and the NO-Si;gamma-nitroglycerine propylmethyl dimethoxysilane (*4) styrene unit [0095] As work examples 1-5 and comparative example 1 raw rubber, using the diene rubber of diene rubber No.1 created in the example of manufacture - 4, it is based on the combination formula of Table 2, and is in the Brabender type mixer with a capacity of 250ml, The remaining compounding agents excluding sulfur and a vulcanization accelerator in the whole quantity of

raw rubber, the half amount of silica, the half amount of a silane coupling agent, and the whole quantity of diethylene glycol were added after mixing during 2 minutes at 170 degrees C, and it kneaded for 3 minutes at this temperature.

[0096] Next, after adding the obtained mixture, and sulfur and a vulcanization accelerator to the 50-degree C open roll and kneading them, press cure was carried out for 30 minutes at 160 degrees C, the specimen was created, and each physical properties were measured. The result was shown in Table 3.

[0097]

[Table 2]

配合 1	一回目	二回目	三回目
原料ゴム	全量	—	—
シリカ	40	40	—
シランカップリング剤 (*1)	3	3	—
ジエチレングリコール	2	—	—
アロマオイル	—	20	—
酸化亜鉛	—	変量	—
ステアリン酸	—	2.5	—
ワックス	—	5	—
老化防止剤 (*2)	—	2	—
硫黄	—	—	1.5
加硫促進剤 (*3)	—	—	3

[0098] (*1) Si69 (made by Degussa)

(*2) NOKURAKKU 6C (made by an Ochi new company)

(*3) Nocceler CZ (made by an Ochi new company)

[0099]

[Table 3]

	実 施 例					比較例
	1	2	3	4	5	1
<u>ゴム成分(部)</u>						
ジイソ系ゴムNo.1	100	—	—	—	—	—
ジイソ系ゴムNo.2	—	100	100	—	—	—
ジイソ系ゴムNo.3	—	—	—	100	100	—
ジイソ系ゴムNo.4	—	—	—	—	—	100
シリカ (*1)	80	—	—	80	80	—
シリカ (*2)	—	80	—	—	—	—
シリカ (*3)	—	—	80	—	—	80
ZnO	1.5	3	3	1.5	3	3
300%応力(Kgf/cm ²)	137	116	106	142	127	100
tan δ 60℃指数 (*4)	129	118	110	135	122	100
耐摩耗指数 (*4)	146	112	104	151	136	100
加工性	B	B	C	B	B	D

[0100] (*1) Z1165MP (Rhone Poulenc S.A. make; nitrogen adsorption specific surface area =175m²/g)

(*2) NIPUSHIRU AQ (Japanese silica company make; nitrogen adsorption specific surface area =200m²/g)

(*3) NIPUSHIRUVN3 (Japanese silica company make; nitrogen adsorption specific surface area =240m²/g) (*4) -- these indices set the comparative example 1 to 100.

[0101] as for the rubber constituent (work examples 1-5) of this invention, the result of Table 3 shows that boil markedly any characteristics of tensile strength, febrility, abrasion resistance, and workability, and they are improved compared with the case (comparative example 1) where diene rubber with few amounts of vinyl bindings of a conjugated diene joint unit portion is used. moreover -- moreover, what tensile strength, febrility, and abrasion resistance will be further improved if silica with a small specific surface area is used (comparison of work examples 2 and 3), and tensile strength and febrile and wear-resistant characteristics are further improved for by limiting the loadings of zinc white (comparison of work examples 4 and 5) is understood.

[0102] As work examples 6-9 and comparative example 2 raw rubber, using the diene rubber of a commercial item diene rubber No.2 created in the example of manufacture, 4, and given in Table 5, it is based on the combination formula of Table 4, and is in the Brabender type mixer with a capacity of 250ml, After mixing during 2 minutes, sulfur, and the remaining

compounding agents excluding a vulcanization accelerator in the whole quantity of raw rubber, the whole quantity of silica, the half amount of a silane coupling agent, and the whole quantity of diethylene glycol were added at 170 degrees C, and it kneaded for 3 minutes at this temperature.

[0103] Next, after adding the obtained mixture, and sulfur and a vulcanization accelerator to the 50-degree C open roll and kneading them, press cure was carried out for 30 minutes at 160 degrees C, the specimen was created, and each physical properties were measured. The result was shown in Table 5.

[0104]

[Table 4]

配合 2	一回目	二回目	三回目
原料ゴム	全量	—	—
シリカ	全量	—	—
カーボンブラック (*1)	—	全量	—
シランカップリング剤 (*2)	4	—	—
ジエチレングリコール	3	—	—
アロマオイル	—	30	—
酸化亜鉛	—	変量	—
ステアリン酸	—	2	—
ワックス	—	5	—
老化防止剤 (*3)	—	2	—
硫黄	—	—	1.4
加硫促進剤 (*4)	—	—	3.5

[0105] (*1) Ceased KH (made by Tokai Carbon Co., Ltd.)

(*2) Si69 (made by Degussa)

(*3) NOKURAKKU 6C (made by an Ochi new company)

(*4) Nocceler CZ (made by an Ochi new company)

[0106]

[Table 5]

	実 施 例				比較例
	6	7	8	9	2
<u>ゴム成分(部)</u>					
ジエン系ゴムNo.2	100	80	60	40	—
ジエン系ゴムNo.4	—	—	—	—	80
BR1220 (*1)	—	20	—	—	20
天然ゴム (*2)	—	—	40	60	—
<u>配合剤(部)</u>					
シリカ (*3)	40	40	30	—	40
シリカ (*4)	—	—	—	30	—
カーボンブラック	20	20	30	30	20
300%応力(Kgf/cm ²)	129	117	117	112	100
tanδ 60℃指数 (*5)	113	116	120	106	100
耐摩耗指数 (*5)	137	125	132	118	100
加工性	B	B	A	B	D

[0107] (*1) Polybutadiene (made by Nippon Zeon Co., Ltd.)

(*2) RSS No. 3

(*3) Z1165MP (*4) NIPUSHIRU AQ (Japanese silica company make; nitrogen adsorption specific surface area =200m²/g)

[0108] The result of Table 5 shows that the tensile strength, the febrility, abrasion resistance, and workability which were excellent even if the rubber constituent of this invention used silica and carbon black together as a reinforcer are shown (work examples 6-9). moreover, it turns out that tensile strength, febrility, abrasion resistance, and the thing [any] characteristics of workability resemble this invention markedly, and are improved compared with what used diene rubber with few amounts of vinyl bindings of a conjugated diene joint unit to a rubber constituent (comparative example 2) (work example 7).

[0109] The embodiment of this invention is shown below.

(1) An amino group and an alkoxy silyl machine Diene rubber whose weight average molecular weights it is the polymer (**) of 60 to 0 weight % of aromatic vinyl monomer units in 40 to 100 weight % of conjugated diene monomeric units which it has, and the amount of vinyl bindings of a conjugated diene joint unit is 100,000-2,000,000 at 60% or more.

(2) Diene rubber given in (1) which an amino group and an alkoxy silyl machine combine with the end of a polymer chain.

(3) Diene rubber given in (2) which an amino group combines with one end of a polymer chain,

and an alkoxy silyl machine combines with the other end.

(4) An amino group is a general formula (1).

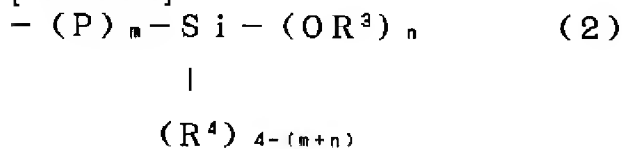
[Formula 5]



(-- among a formula, an alkyl group, a cycloalkyl machine, an aryl group, an aralkyl machine, an alkoxyalkyl group or R¹, and R² may combine with each other, and R¹ and R² may form a ring system independently, respectively.) -- diene rubber given in either of (1) - (3) which is what is expressed.

(5) An alkoxy silyl machine is a general formula (2).

[Formula 6]



(R³ and R⁴ should have among a formula the alkyl group and substituent which may have a substituent.) The aralkyl machine which may have the aryl group which may have a cycloalkyl machine with sufficient **, and a substituent, or a substituent, The polymer (**) chain of conjugated diene or conjugated diene, and aromatic vinyl and m show the integer of 1-3, n shows the integer of 1-3, and, as for P, m+n shows the integer of 2-4. (1) which is what is expressed Diene rubber given in either of - (4).

(6) The aromatic vinyl chain distribution in the case of containing an aromatic vinyl joint unit is [the amount of simple chains of one aromatic vinyl unit] 40weight % or more of the amount of joint aromatic vinyl, And diene rubber given in either of (1) - (5) whose amounts of aromatic vinyl long chains with which eight or more aromatic vinyl was connected are 5 or less weight % of the amount of joint aromatic vinyl.

[0110] (7) Let organic alkali metal amide be an initiator for conjugated diene or conjugated diene, and aromatic vinyl in a hydrocarbon system solvent. The manufacture method of diene rubber given in either of (1) - (6) characterized by making an alkoxysilane compound or an epoxy group content alkoxysilane compound react after making it polymerize under existence of a polar compound (**).

(8) The manufacture method given in (7) using the thing to which organic alkali metal amide made the organic alkali metal and the secondary amine compound react beforehand.

(9) (7) or the manufacture method given in (8) the amount of the organic alkali metal amide used is 0.1 - 30mmol to 100g of monomers.

(10) The manufacture method given in (7) which adds an organic alkali metal and secondary amine to a polymerization system.

(11) The manufacture method given in (10) that the amount of the organic alkali metal used is

0.1 - 30mmol to 100g of monomers.

(12) (10) or the manufacture method given in (11) the amount of the secondary amine used is 0.5-2Eq to an organic alkali metal.

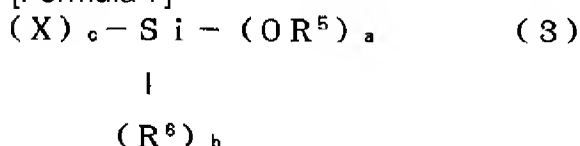
[0111] (13) The manufacture method given in either of (7) - (12) whose amount of the polar compound used is 0.1-100mol to organic alkali metal amide or 1mol of organic alkali metals.

(14) The manufacture method given in either of (7) - (13) which is at least one sort as which a polar compound is chosen from an ether compound, tertiary amine, alkali metal alkoxide, and a phosphine compound.

(15) The manufacture method given in (14) that a polar compound is tertiary amine or a diether compound.

[0112] (16) An alkoxyasilane compound is a general formula (3).

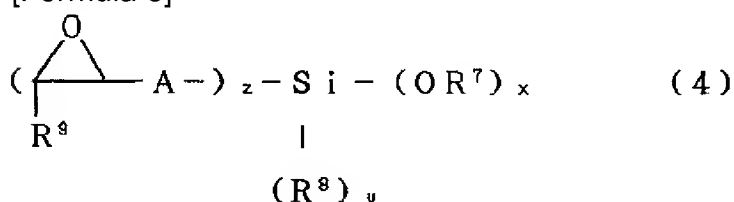
[Formula 7]



(R5 and R6 should have among a formula the alkyl group and substituent which may have a substituent.) The aralkyl machine which may have the aryl group which may have a cycloalkyl machine with sufficient **, and a substituent, or a substituent, The integer of 1-4 and b show the integer of 0-3, c shows the integer of 0-3, and, as for X, a+b+c shows four, as for a halogen atom and a. (7) which is what is expressed The manufacture method given in either of - (15).

(17) An epoxy group content alkoxyasilane compound is a general formula (4).

[Formula 8]



R7 and R8 should have among [type the alkyl group and substituent which may have a substituent. The aralkyl machine which may have the aryl group which may have a cycloalkyl machine with sufficient **, and a substituent, or a substituent, The cycloalkyl machine which may have a hydrogen atom, the alkyl group in which you may have a substituent, and a substituent R9, The aralkyl machine which may have the aryl group which may have a substituent, or a substituent, A is alkylene group, arylene machine, alkylene arylene machine, arylene alkylene group, or general formula (5)-A1-O-A2. - (among a formula) A1 and A2 show an alkylene group, an arylene machine, an alkylene arylene machine, or an arylene alkylene group. As for a machine and x, the integer of 1-3 and y show the integer of 0-2, z shows the integer of 1-3, x+y+z shows four, and A and R9 may form a ring system unitedly. The

manufacture method given in either of (7) - (15) which is what is expressed with].

[0113] (18) Rubber constituent containing the rubber component which contains the diene rubber of a description in either of (1) - (6), and a reinforcer.

(19) The rubber constituent given in (18) the given content of this diene rubber is 10 weight % or more in a rubber component.

(20) (18) or a rubber constituent given in (19) using a reinforcer 10 - 200 weight parts to a rubber component 100 weight part.

(21) A rubber constituent given in either of (18) - (20) whose reinforcers are carbon black.

[0114] (22) A rubber constituent given in either of (18) - (20) which is that in which a reinforcer contains silica.

(23) The rubber constituent given in (22) the given specific surface area of silica is 50-400m²/g in nitrogen adsorption specific surface area (BET adsorption method).

(24) Rubber constituent given in either of (18) - (23) which contains a silane coupling agent further.

(25) The rubber constituent given in (24) the given loadings of a silane coupling agent are 0.1 - 30 weight part to a silica 100 weight part.

[0115] (26) Rubber constituent given in either of (18) - (25) which contains a vulcanizing agent, a vulcanization accelerator, and a vulcanization activator further.

(27) The rubber constituent given in (26) which is a vulcanizing agent 0.1 - 15 weight parts and the vulcanization accelerator 0.1 - 15 weight parts to a rubber component 100 weight part.

(28) (26) or the rubber constituent given in (27) which is that in which a vulcanization accelerator contains a sulfenamide system vulcanization accelerator at least.

(29) A rubber constituent given in either of (26) - (28) which is the thing containing zinc oxide as a vulcanization activator.

(30) The rubber constituent given in (29) the given amount of the zinc oxide used is two or less to a rubber component 100 weight part.

[0116]

[Effect of the Invention] When silica is blended as a reinforcer according to this invention, while the outstanding febrility is shown, the diene rubber excellent also in tensile strength, abrasion resistance, and workability and its manufacture method are offered. Moreover, according to this invention, the rubber constituent with which febrility, tensile strength, abrasion resistance, and workability have been improved sharply is offered.

[0117] The rubber constituent containing the diene rubber of this invention, and it, Taking advantage of the characteristics, a various application, for example, a tread, a carcass, all [SAIDOU], Use becomes possible as resin strengthening rubber, such as use to rubber goods, such as use to tire each part, such as a bead part, or a hose, a window frame, a belt, a sole, a rubber vibration insulator, and autoparts, and also high impact polystyrene, and ABS

plastics.

[0118] Although especially the rubber constituent containing the diene rubber of this invention and it is excellent in the tire tread of a low-fuel-consumption tire, In addition, it is suitable as rubber material, such as all [SAIDOU / tire treads, such as a year-round tire, a highly efficient tire, and a studless tire, and], a under tread, a carcass, and a beat part.

[Translation done.]